STUDIES ON THE AUSTRALIAN CICINDELIDAE III: OBSERVATIONS ON THE AUSTRALIAN MEMBERS OF THE GENUS *CICINDELA* L. (COLEOPTERA)[1]

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ABSTRACT: Bionomical observations and collecting data are presented for the following Australian species of the genus *Cicindela: C. iosceles* Hope, *C. sparsimpilosa* W. Horn, *C. crassicornis* Macleay, *C. doddi* Sloane, *C. arachnoides* Sumlin, *C. leai leai* Sloane, *C. leai demarzi* Mandl, *C. oblongicollis* Macleay, *C. nigrina* Macleay, *C. darwini* Sloane, *C.tetragramma* Boisduval, *C. albolineata* Macleay, *C. aeneodorsis* Sloane, *C. levitetragramma* Freitag, *C. ypsilon albicans* Chaudoir, *C. rafflesia rafflesia* Chaudoir, *C. rafflesia pseudorafflesia* W. Horn, *C. frenchi* Sloane, *C. saetigera* W. Horn, *C. semicincta* Brulle, *C. mastersi catoptriola* W. Horn, *C. mastersi plebeia* Sloane and *C. discreta* Schaum. Range extensions are presented for *C. crassicornis, C. darwini* and *C. mastersi plebeia.*

Although the tiger beetles are a popular group with collectors, there is a paucity of information concerning the behavioral ecologies, preferred habitats, etc. of the Australian members of the family. Noteworthy papers include W. Horn (1892, 1893, 1901 and 1913), Sloane (1905, 1906, 1909, 1913, 1914, 1917 and 1921), Mjoberg (1916), Lea (1917) and Freitag (1979), but the majority of these are taxonomic in content and disclose very little pertinent information concerning how to go about collecting Australian tiger beetles.

I developed the majority of the following data during my expedition to Australia in 1978-1979. Other observations were made by Allan Walford-Huggins of Jullaten, Queensland (Qld.), Australia and Noel McFarland of Nabawa, Western Australia (W. A.). Noel McFarland currently resides at Sierra Vista, Arizona.

For purposes of clarity, the species are ranked phylogenetically within their subgenera as set forth by Sumlin (1981). For a complete list of collecting localities, see Sumlin (1980).

SUBGENUS *ANTENNARIA* DOHKTOUROFF, 1883

Cicindela iosceles Hope

Cicindela iosceles Hope, 1841, Proc. Ent. Soc. London 4:45.

Observed Habitat: This species was always associated with light-

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colored sand and low-growing grasses in or near forests. North of Cooktown, Qld., I took over 80 specimens along a sandy roadrut leading into a closed forest. In the Northern Territory (N.T.), I found it on sandy roadcuts leading into open and closed forests.

Dates of Collection: Qld.: 17-18-XII-1978; N.T.: 6-I-1979, 8&9-I-1979.

Remarks: *C. iosceles* was usually quick to take flight, but normally flew only 2-3 meters and was easily netted. The species has a peculiar habit of antennating like a wasp. The antennation, or co-ordinated bobbing of the antennae, was most pronounced when the beetles were walking, although they also performed the action while at rest. I observed individuals near Cooktown for nearly an hour in an attempt to learn if the antennation was connected with any other activity. It did not appear to be as the beetles antennated constantly, no matter what they were doing. Another oddity noted for this species (and others) was that it spends its nocturnal hours off the ground clinging to pieces of vegetation (Fig. 1). This behavior was noted initially while I was searching for *Megacephala* species along a roadrut at night. What I took to be weevils attached to blades of grass and pieces of twigs, turned out to be individuals of *C. iosceles.* All beetles taken or observed were located at heights no greater than ca. 5 cm from the surface of the roadrut. Although *C. iosceles* is listed by Larochelle (1977) as coming to lights, it will normally not do so unless knocked from its nocturnal perch. Freitag (1979) listed the habitat of this species as being "open places, mainly near fresh water" which does not appear to be the case.

Cicindela sparsimpilosa W. Horn

Cicindela sparsimpilosa W. Horn, 1913, Arch. Naturg. Arb., 79(2):29.

Observed Habitat: *C. sparsimpilosa* was always taken in the same type of habitat as preferred by *C. iosceles,* but it tended to stay more in the shade of plants rather than out in the open.

Dates of collection: 30-XII-1978, 5&6-I-1979, 9&10-I-1979.

Remarks: This species was a little quicker to take flight than the preceding species and usually flew for a greater distance (5-10 m). Upon landing, it would normally seek cover in the shade of plants. Like *C. iosceles,* it antennated, although not as often nor as vigorously; it was also found to spend its nocturnal hours in the same manner. It is reported to come to lights by Freitag (1979), but it behaves like *C. iosceles* in that respect.

Cicindela crassicornis Macleay

Cicindela crassicornis Macleay 1888, Proc. Linn. Soc. N.S.W. (2), 3:445.

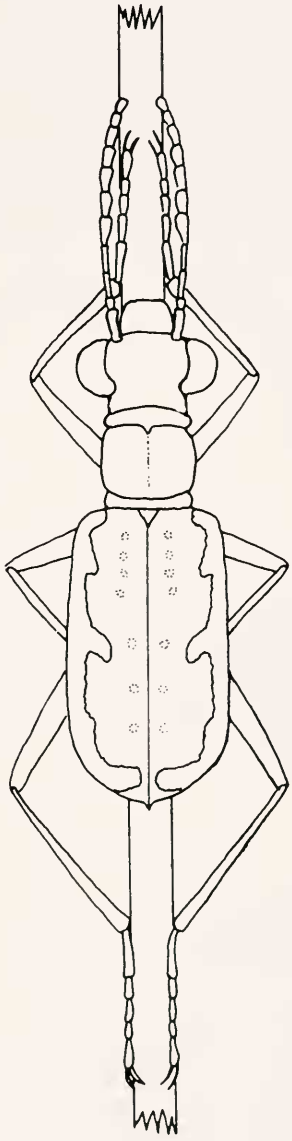

Fig. 1

Fig. 1. Dorsal view of *Cicindela iosceles* Hope in vertical, nocturnal, resting position on small twig.

Observed Habitat: This species was always taken in association with light-red sand supporting low vegetation. Most specimens were taken along sandy, grassy gullies near roadsides. The species seemed to prefer the open areas in such situations as it was rarely taken near the cover vegetation.

Date of Collection: 11-1-1979.

Remarks: Like *C. iosceles,* this species was a strong antennator, a weak flier and clung to vegetation at night. Mating pairs were seen at various localities and seemed to restrict themselves to areas where the sand was visibly wet or moist. The specimens reported by Sumlin (1980) from N.T., 17.2 km W. Timber Creek represent a new state record for the species.

Cicindela doddi Sloane

Cicindela doddi Sloane, 1905, Proc. Linn. Soc. N.S.W., 30:230.

Observed Habitat: *C. doddi* was collected on 2 occasions and, in both instances, was restricted to areas of heavy, red, clay soils supporting low-growing grasses. At neither location was it found near water as stated by Freitag (1979). Like the preceding species, *C. doddi* preferred open areas among the grasses.

Dates of Collection: 20-XII-1978, 28-XII-1978.

Remarks: This species proved to be the most aberrant of the *Antennaria* with respect to behavior and habitat. It is also structurally the most aberrant known species of the subgenus. It was never observed to antennate, which may indicate a correlation between dilated antennal segments (possessed by *C. iosceles, C. sparsimpilosa* and *C. crassicornis*) and the act of antennation; in contrast, *C. doddi* has non-dilated antennae. It is not known whether this species spends it nocturnal hours in the same manner as the other *Antennaria* as I never, knowingly, spent a night near a population.

SUBGENUS *MACFARLANDIA* SUMLIN, 1981

Cicindela arachnoides Sumlin

Cicindela (Macfarlandia) arachnoides Sumlin, 1981, Coleopt. Bull., 35:275.

Observed Habitat: This species was collected by Noel MacFarland on a fine, sandy-clay soil near low-growing, evergreen shrubs and on an adjacent sandy firebreak ca. 23 km SE Northampton, W.A.

Dates of Collection: 11-VII-1978, 6-VIII-1978, 10-VIII:1978.

Remarks: *C. arachnoides* is the only Australian member of the genus known to be active during the winter months.

SUBGENUS *MICROMENTIGNATHA* SUMLIN, 1981

Cicindela leai leai Sloane

Cicindela leai Sloane, 1905, Proc. Linn. Soc. N.S.W., 30:234.

Observed Habitat: *C. l. leai* was usually found in open, grassy areas near light-colored sand or coarse alluvium. It was usually found in the open, but not far from the surrounding vegetation.

Dates of Collection: 15-XII-1978, 20-XII-1978, 24-26-XII-1978, 28-XII-1978.

Remarks: This species, like *C. iosceles,* spends its nocturnal hours clinging to vegetation. The species is listed by Larochelle (1977) as coming to lights but it, again, is similar to *C. iosceles* in this respect. It was quick to fly, but normally flew only a distance of a meter or two. All sampled populations contained a high percentage of melanic individuals.

Cicindela leai demarzi Mandl

Cicindela nigella demarzi Mandl, 1960, Ent. Arb. Mus. G. Frey, 11:279.
Cicindela leai demarzi Mandl, Sumlin, 1981, Coleopt. Bull., 35:277.

Observed Habitat: This subspecies was taken in sandy situations associated with low-growing vegetation — usually grasses. It was taken, in many instances, along sandy roadruts and on the floor of open forests.

Dates of Collection: 5&6-I-1979, 9-I-1979.

Remarks: *C. l. demarzi* is apparently restricted to the state of N.T. Both subspecies were most active following rains and, in two instances, were collected during rainstorms.

Cicindela oblongicollis Macleay

Cicindela oblongicollis Macleay, 1888, Proc. Linn. Soc. N.S.W.(2), 3:445.

Observed Habitat: *C. oblongicollis* was taken at one location in northern W.A. on light-red sand associated with short grasses.

Date of Collection: 11-I-1979.

Remarks: The single specimen was taken running through grasses on small sand hummocks. It was an old specimen as it was missing tarsal segments and much of its setae were abraded.

SUBGENUS *ARCHIDELA* RIVALIER, 1963

Cicindela nigrina Macleay

Cicindela nigrina Macleay, 1863, Trans. Ent. Soc. N.S.W., 1:107.

Observed Habitat: This species was taken in two different habitats: on a salt flat north of Cooktown, Qld. and at blacklight near the Endeavour River north of Cooktown. On the salt flat it was found in association with grasses along the playa margin while the blacklights were located on a sandy roadrut leading into closed forest approximately 100 m north of the river.

Dates of Collection: 17 & 18-XII-1978.

Remarks: *C. nigrina* was quite wary on the salt flat and would fly for long distances (15-20 m). Several were seen, but only two were netted.

Cicindela darwini Sloane

Cicindela darwini Sloane, 1909, Proc. Linn. Soc. N.S.W., 34:299.

Observed Habitat: *C. darwini* was collected at light by Allan Walford-Huggins at Kelso Inlet, Delta Downs Station, Qld. on a mangrove beach located on the Gulf of Carpentaria.

Date of Collection: 3-XII-1982.

Remarks: The above mentioned specimens represent a new state record for Qld. as the species, heretofore, has only been known from N.T. Walford-Huggins states (*in litt.*) that he did not see any cicindelids at the location during the daylight hours, but *C. darwini, C. aeneodorsis* Sloane and *C. albolineata* Macleay all come to lights at night.

SUBGENUS *EUZONA* RIVALIER, 1963

Cicindela tetragramma Boisduval

Cicindela tetragramma Boisduval, 1835, Voyage de l'Astrolabe, 2:6.

Observed Habitat: *C. tetragramma* was taken on tidal salt flats at Nickol Bay and Carnarvon, W.A. and on sandy seabeach at Carnarvon.

Dates of Collection: 16&18-I-1979.

Remarks: This species proved to be quite wary and difficult to secure with a net. I spent over three hours on the flats at Nickol Bay and saw many individuals, but only managed to net nine of them during that time. Mating pairs were observed at that locality at dusk. During the day, the species normally would not allow me to approach any closer than 8 m before it took flight. Prior to flight, it would usually begin to run a rapid zig-zag pattern in much the same manner as members of the Nearctic subgenus *Ellipsoptera* Dohktouroff. After taking wing, the beetles would fly out onto the flats to distances of 10 to 20 m. The species was found to be heavily attracted to UV lights (15w longwave and 15W shortwave) as I collected in excess of 200 in that manner in less than an hour. *C. tetragramma* was the only species I

encountered in Australia that emitted an odor when captured or handled. The odor was similar to that of stale beer.

Cicindela albolineata Macleay

Cicindela albolineata Macleay, 1888, Proc. Linn. Soc. N.S.W.(2), 3:444.

Observed Habitat: See *C. darwini.*
Date of Collection: See *C. darwini.*
Remarks: See *C. darwini.*

Cicindela aurita Sloane

Cicindela aurita Sloane, 1904, Proc. Linn. Soc. N.S.W., 29:528.

Observed Habitat: Not observed.
Dates of Collection: Unknown.
Remarks: Freitag (1979) speculated that this species may be found on ocean beaches. That is a possibility; however, the localities listed by him for *C. aurita* (Port Alma, Cooktown and Cairns, Qld.) have only one habitat in common — tidal salt flats.

Cicindela aeneodorsis Sloane

Cicindela aeneodorsis Sloane, 1917, Proc. Linn. Soc. N.S.W., 42:337.

Observed Habitat: See *C. darwini.*
Date of Collection: See *C. darwini.*
Remarks: See *C. darwini.*

Cicindela levitetragramma Freitag

Cicindela levittragramma Freitag, 1979, Aust. J. Zoo. Suppl. Ser., 66:39.

Observed Habitat: This species was taken on a sandy mangrove beach at Broome, W.A. Most of the specimens were collected near the water's edge.
Date of Collection: 14-I-1979.
Remarks: *C. levitetragramma* proved to be a wary species, but not nearly so as *C. tetragramma,* nor was its flight as strong. It is attracted to blacklights, although not as strongly as *C. tetragramma.* Mating pairs were observed at the water's edge near dusk.

SUBGENUS *HYPAETHA* LE CONTE, 1860

Cicindela ypsilon albicans Chaudoir

Cicindela albicans Chaudoir, 1854, Bull. Soc. Imp. Nat. Moscou, 27:117.
Cicindela ypsilon albicans Chaudoir, Freitag, 1979, Aust. J. Zoo. Suppl. Ser., 66:45.

Observed Habitat: This species was taken at Armstrong Beach, Qld. Most of the specimens were collected along the high-tide mark on sandy seabeach.

Date of Collection: 5-XII-1978.

Remarks: *C. y. albicans* was somewhat difficult to see when it flew as it blended quite well with the color of the beach sand on which it was found. It appeared to be most active during the morning and late afternoon hours and is attracted to blacklights. Its flight was usually not strong and covered only about 3 or 4 m.

Cicindela rafflesia rafflesia Chaudoir

Cicindela rafflesia Chaudoir, 1852, Bull. Soc. Imp. Nat. Moscou, 25:13.

Observed Habitat: *C. r. rafflesia* was normally encountered on sandy seabeach above the high-tide mark; although at Carnarvon, W.A., it was also taken on a tidal salt flat.

Dates of Collection: 6&7-I-1979, 18-I-1979.

Remarks: Like the preceding species, *C. r. rafflesia* was very difficult to see against beach sand due to its coloration. It normally flew only a short distance when pressed to fly. Mating pairs were noted at all localities where it was present.

Cicindela rafflesia pseudorafflesia W. Horn

Cicindela pseudorafflesia W. Horn, 1925, Ent. Blatter, 21:139.
Cicindela rafflesia pseudorafflesia W. Horn, Sumlin, 1981, Coleopt. Bull., 35:278.

Observed Habitat: This subspecies was encountered only at Broome, W.A. on a sandy mangrove beach above the high-tide mark.

Date of Collection: 14-I-1979.

Remarks: *C. r. pseudorafflesia* behaved in the same manner as the nominate subspecies, although it was easier to see on the beach due to its wide maculation. It is attracted to blacklights.

Cicindela frenchi Sloane

Cicindela frenchi Sloane, 1904, Proc. Linn. Soc. N.S.W., 29:527.

Observed Habitat: *C. frenchi* was taken at a single location — Derby,

W.A. It was only found along the margins of a large tidal salt flat.

Date of Collection: 13-I-1979.

Remarks: This species was not in abundance at the above locality as only 8 specimens were seen and taken. Of those, 5 were collected at blacklights along the margin of King Sound. No mating pairs were seen.

SUBGENUS *RIVACINDELA* VAN NIDEK, 1973

Cicindela saetigera W. Horn

Cicindela saetigera W. Horn, 1893, Deutsche Ent. Zeitschr., p. 198.

Observed Habitat: This species was taken on a salt flat just south of Tailem Bend, S.A. Most specimens were taken along the margin of the playa.

Date of Collection: 23-I-1979.

Remarks: *C. saetigera* displayed a preference for running not seen in other Australian species. At first, I thought the species was incapable of flight as individuals would not fly. After netting several, I attempted to coax an individual to fly. With some nudging, it took flight and flew approximately 20 m. Mating pairs were observed in the late afternoon hours.

SUBGENUS *MYRIOCHILE* MOTSCHULSKY, 1861

Cicindela semicincta Brullé

Cicindela semicincta Brullé, 1834, Rev. Ent. 2, p. 100.

Observed Habitat: This species was normally encountered near the water, along streams, rivers, beaches, and salt flats in Qld. and N.T.

Dates of Collection: 3-5-XII-1978, 17-XII-1978, 24-26-XII-1978, 28-30-XII-1978, 5-I-1979.

Remarks: This is the most commonly encountered species on the continent. Although quite wary during the day, it is heavily drawn to blacklights at night — especially after rains have fallen. Mating pairs were observed at many locations.

Cicindela mastersi catoptriola W. Horn

Cicindela catoptriola W. Horn, 1901, Deutsche Ent. Zeitschr., p. 355.
Cicindela mastersi catoptriola W. Horn, Sloane, 1909, Proc. Linn. Soc. N.S.W., 34:301.

Observed Habitat: *C. m. catoptriola* was always taken in or near grasses not far from water.

Dates of Collection: 29-XII-1978, 5-I-1979, 9-I-1979, 11-I-1979.

Remarks: This subspecies was never abundant where it was found. It proved to be quite wary and would hide among the shadows of the grasses that dotted its habitat. Once discovered, it would fly quickly for 2 to 3 m and run back into the shadows. One specimen, previously reported by Sumlin (1980) as a nominate *C. mastersi,* came to blacklights at the Einasleigh River east of Georgetown, Qld.

Cicindela mastersi plebeia Sloane

Cicindela plebeia Sloane, 1905, Proc. Linn. Soc. N.S.W., 30:232.
Cicindela mastersi plebeia Sloane, Sloane, 1909, Proc. Linn. Soc. N.S.W., 34:301.

Observed Habitat: Like the preceding subspecies, this one was found to be associated with grassy areas near standing water. *C. m. plebeia* was normally found on very dark brown or black soils whereas *C. m. catoptriola* occurred on red or red-brown soils.

Dates of Collection: 17&18-XII-1978, 20-XII-1978, 9-I-1979, 11-I-1979.

Remarks: Although this species was examined by Freitag (1979) in some detail, it needs further study with respect to specific/subspecific rankings. At one location in N.T. (75.8 km N Katherine), I found *C. m. catoptriola* and *C. m. plebeia* together behaving as "good" species. During later studies on my *C. mastersi* specimens, I noted that all of my *C. m. catoptriola* specimens (17) possessed proepisterna that were quite setose and rugose while all my *C. m. plebeia* (31) were found to have proepisterna that were glabrous (except for the extreme ventral edge) and smooth. Although my samples are not large enough to draw valid conclusions from, it would appear that further study is needed on the species. The specimens reported as *C. m. catoptriola* from various localities in N.T. (75.8 km N Katherine, 10.1 km S Adelaide River and 9.1 km E Timber Creek) by Sumlin (1980) represent new state records for *C. m. plebeia.*

SUBGENUS *CYLINDERA* WESTWOOD, 1831

Cicindela discreta discreta Schaum

Cicindela discreta Schaum, 1863, Jour. Ent., 2:59.

Observed Habitat: *C. discreta* was encountered at but a single location just north of Cooktown, Qld. Six specimens were taken at blacklights set up on a roadrut leading into a closed forest. No diurnal observations were made on the species.

Date of Collection: 17-XII-1978.

Remarks: The species *C. froggatti* Macleay was long held as a synonym of *C. discreta* by Walter Horn and was retained in that capacity by Freitag (1979). However, van Nidek (1980) recognized it as a valid subspecies of *C. discreta* based upon a study series taken at Kuranda, Qld. My small series from near Cooktown bear no resemblance to Macleay's (1887) original description nor to characters pointed out by van Nidek (1980). As Freitag (1979) is the last reviewer of the species, his view is followed here.

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LITERATURE CITED

Freitag, R. 1979. Reclassification, phylogeny and zoogeography of the Australian species of *Cicindela* (Coleoptera: Cicindelidae). Aust. Jour. of Zoo. Supp. Ser. 66:1-99.

Horn, W. 1892. Einige neue Cicindeliden — Arten und Varietaten. Deutsche Ent. Zeitschr. (2):369-372.

Horn, W. 1893. Neue Cicindeliden. Deutsche Ent. Zeitschr. (1):197-200.

Horn, W. 1901. De septem novis cicindelides. Deutsche Ent. Zeitschr. (2):353-358.

Horn, W. 1913. 50 neue Cicindelinae. Archiv fur Naturg. Abt. A 79 (2):1-33.

Larochelle, A. 1977. Cicindelidae caught at lights. Cicindela, 9(3):50-60.

Lea, A. M. 1917. Notes on some miscellaneous coleoptera with descriptions of new species. Part 3. Trans. Roy. Soc. S. Aust. 41:121-126.

Macleay, W. 1887. The insects of the Cairns district, north Queensland. Proc. Linn. Soc. N.S.W. 2:213-238; 307-328.

Mjoberg, E. 1916. Results of Dr. E. Mjoberg's Swedish Scientific Expeditions to Australia 1910-1913. 9. Cicindelidae, Gyrinidae, Lucanidae, Paussidae. Ark. Zool. 10(10):1-16, 11 figs.

Sloane, T. G. 1905. Five new species of *Cicindela* from tropical Australia. Proc. Linn. Soc. N.S.W. 30:229-234.

Sloane, TG. 1906. Revision of the Cicindelidae of Australia. Proc. Linn. Soc. N.S.W. 31:309-360, 116 figs.

Sloane, T. G. 1909. Second supplement to the 'Revision of the Cicindelidae of Australia.' Proc. Linn. Soc. N.S.W. 34:296-301.

Sloane, T. G. 1913. Descriptions of two new species of *Cicindela* from Western Australia. Proc. Linn. Soc. N.S.W. 38:401-403.

Sloane, T. G. 1914. Description of a new tiger beetle from north-western Australia. Proc. Linn. Soc. N.S.W. 39:565-567.

Sloane, T. G. 1917. Description of a new tiger beetle from the Northern Territory. Proc. Linn. Soc. N.S.W. 42:337-338.

Sloane, T. G. 1921. Description of a new tiger beetle from the Wyndham district. Proc. Linn. Soc. N.S.W. 46:330-332.

Sumlin, W. D. 1980. Studies on the Australian Cicindelidae I: Initial report on expedition to Australia. Cicindela 12(2):17-23.

Sumlin, W. D. 1981. Studies on the Australian Cicindelidae II: New taxa from Australia (Coleoptera). Coleop. Bull. 35(3):273-280.

van Nidek, C.M.C. Br. 1980. Description of some new Cicindelidae (Col.) Ent. Blatter 75(3):129-137, 7 figs.